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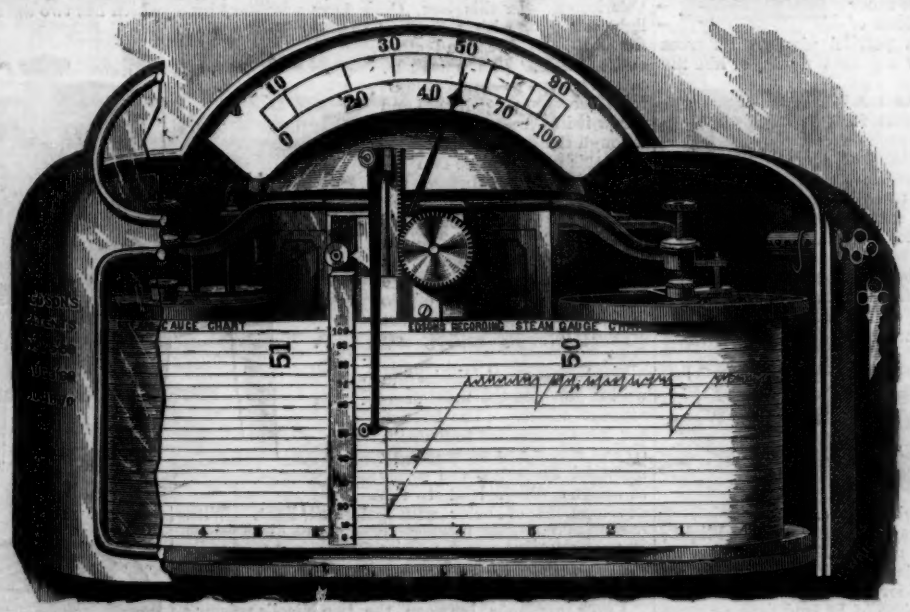
## Edson's Steamometer, or "Recording Steam Gauge and Alarm."

An important, valuable and timely invention. Barometers, gasometers, manometers, photometers and thermometers, are well known to most well-informed adult persons at least, some of which instruments record data which are desirable either in the interest of science or economy, generally; but we have the extreme pleasure at this time, of announcing to our readers an invention seldom equalled in importance; it being largely promotive of the cause of *humanity*, as well as of science and economy.

In the instrument above represented (by a half size cut) beauty is combined with novelty and great utility. We use the term "beauty" in full accord and harmony with the splendid imagery and appreciation of real art, as manifested by the Hon, S. S. Cox in his lecture on the "Poetry of Mechanism."

In the cabin of the steamer "Virgo," of the Savannah line, may be seen the first Steamometer or Recording Steam Gauge and Alarm ever adapted to practical use on a steamer. As shown in the cut, it indicates by the hand before the dial plate, the pressure of the steam within the boiler. It also records upon a long strip of paper "chart" by a vertical line every degree in the increase of pressure, and by oblique tracings describes the degrees in the reduction of pressure continuously as they occur during a day, or for entire voyages, if desired.




EDSON'S STEAMOMETER, OR "RECORDING STEAM GAUGE AND ALARM."

This result is produced by giving the receiving drum or roller (at the right hand as shown) a rotatory motion only when the pressure is decreasing. The vertical scale at the left of the tracing pencil, holds the chart in its place while it is being traced upon, and is convenient also when removing the charts, as the degrees in pressure may then be copied therefrom, and the charts after being dated may be rendered the more intelligible when referred to, at any future time. They should be removed at the end of each week, or at the end of every voyage, and be preserved. An alarm gong (shown under the dial plate) is made to ring continually when the steam pressure exceeds any specified limits. A combination lock with duplicate keys is placed upon every instrument.

Passengers have heretofore only been permitted to read the "Inspector's certificates," which were by law placed where they could thus be informed what working pressure was allowed, whereas they had no means of knowing what pressure was being carried. The notice, "No admittance," deterring them from entering (even if not positively forbidden) the engine room, where only the gauges were kept.

These instruments are intended to be placed in offices of hotels, or manufactories, in the cabin of steamers, or elsewhere, as conspicuously as the "Inspector's certificates" are placed, being reliable checks upon either the carelessness or the presumption of those in charge.

The "charts" being steam written, under such positive conditions of security, will be acknowledged by underwriters, coroners' juries and others, at any time interested, either as principals or employers—as affording *unimpeachable evidence of the facts* they contain.

Surveyors or inspectors of risks for insurance companies, also Inspecting Engineers will rely upon the "charts" to prove the capacity and reliability of those applying for licenses, and the strength or other condition of boilers, for which they shall be called to certify, thus rendering their certificates far more valuable than at present; and insurers will be able to discriminate between risks accordingly as they are affected by carelessness or incompetence of those in charge of steam. The charts taken during five successive trips upon the aforesaid steamer, show progress to a remarkable degree; and we are assured a considerable saving of coal resulted, also a greater uniformity in time occupied in running from port to port. The sense of utmost security attainable against carelessness, experienced by travellers, is of no little importance, and we hope and believe it will not be long before every steam boiler, also every other reservoir of gas, air or water under pressure, will be protected by these risk-reducing instruments, which hitherto have been unattainable.

They were invented by Mr. M. B. Edson and his son Mr. J. B. Edson of this city, and we are glad to find that their persevering efforts (made during several years past in private) have been so eminently successful.

The fact is shown in the vast array of testimonials from the Life, Fire and Marine underwriters of this and other cities, also the numerous civil and mechanical engineers and experts who have unreservedly recommended these Recording Steam Gauges to the public confidence and patronage.

The working parts of these gauges are nickel plated, consequently are non-corrosive, and from the peculiar construction give promise of unusual reliability as well as durability.

The numbers "50" and "51" are sections, which are again subdivided into four parts, "1," "2," "3" and "4," for convenience, when determining work performed during any given time, or by any one when in charge, from time to time.

This invention received the first prize diploma and medal at the Fair of the American Institute in 1870, and has also the hearty endorsement of the United States Board of Supervising Inspecting Engineers at Washington.

They are manufactured and sold under several patents by "The Recording Steam Gauge Company of New York, 91 Liberty street, N. Y., from whom further information can be obtained.

See their advertisement on page 89.

**Chemical Repertory,**

**No. 49.—March 16, 1871.**

EDITOR—HENRY WURTZ.

## AMERICAN CHEMICAL NEWS.

[ORIGINAL COMMUNICATION.]

# LECTURES

## *AT THE PEABODY INSTITUTE.*

By Prof. Henry Morton.

### On "LIGHT," with Experiments.

Communicated Exclusively to this Journal by Prof. Morton.]

[Concluded from page 67.]

SIXTH AND LAST DAY—THURSDAY, NOV. 24.

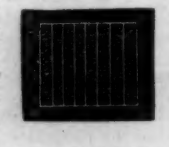
### POLARIZED LIGHT.

The fine night and the reputation of the previous lectures brought to the Peabody Institute this evening, although it was Thanksgiving Day, as large an audience as ever, and with the encouraging inspiration of countless bright and attentive eyes the Professor commenced his discourse as follows:

I must ask you this evening for a little while to give me the closest attention that is possible, for we have before us the most intricate and complex subject which the science of optics affords—the phenomenon namely of polarized light.

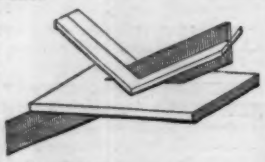
Allow me first, in as few words as possible, to give you a physical parallel or embodiment of ideas on this subject, and we can then pass at once to the actions and effects themselves.

We consider that in a ray of ordinary light there are vibrations taking place, either simultaneously or consecutively in all planes that contain the line of direction of a ray. That the cross section of such a ray would be like the accompanying figure, or like the spokes of a wheel, the lines of the spokes representing the directions in which various particles were vibrating. A ray of polarized light on the other hand has all the vibrations of which it is composed in parallel planes. Its cross section would be like the adjacent figure, or like the bars of a grating. This at least is simple enough, and we need here only further notice, that for convenience it is well to assume that all the various vibrations of an ordinary ray are collected into two planes at right angles to each other, or that the cross section in place of being like the spokes of a wheel is like a cross.



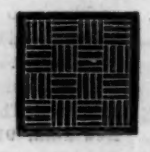
This it will be remembered is only an assumption, but it is not an unwarrantable one, and is only retained as long as, or in those cases where, it is practically equivalent to the actual fact.

With this modification we would say that a ray of polarized light might be represented by a flat ruler and a ray of ordinary light, by two such rulers united lengthwise at right angles, as in the accompanying figure.



We next come to the way of getting polarized light; of this there are three methods. By reflection, by absorption and by double refraction. Of these we shall to-night only consider the last. When a ray of common light falls on a plate of Iceland spar, or some one of the other bodies which possess double-refracting powers, it will be divided into two rays, which will emerge in different directions, and will each be polarized, or will vibrate in a single set of planes, but the sets of the two rays will be at right angles to one another. It will seem as if the two rulers of our comparison were disunited and carried out or onward in different paths.

This property belongs to Iceland spar, quartz, mica, selenite and a number of other substances in varying degrees, and with certain fixed relations to their directions of crystallization; and we may well illustrate this property further by saying that plates of such bodies, cut in the proper direction, are capable of transmitting light-vibrations only in two directions, or like sieves with rectangular slits, as appears in the accompanying figure, so that light-rays vibrating parallel with the side A B, could go through the openings in that direction, and those vibrating parallel to B C, could go through the slits that were in *that* direction.

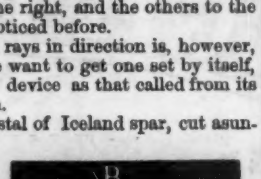


You understand, of course, that this is only an illustration of a mechanical character, but important as an aid to the memory in following, for the first time, so complex a system of facts as must be involved in any discussion of polarized light.

Let us now suppose that a ray of ordinary light came upon a double refracting body such as figure 4 represents, some of the rays would be parallel with the vertical slits, and some to the horizontal ones, and so some of each would go through, but the vertical ones would be bent to the right, and the others to the left (relatively), as we noticed before.

This separation of the rays in direction is, however, not great; and when we want to get one set by itself, we must use some such device as that called from its inventor, a Nicol's prism.

This consists of a crystal of Iceland spar, cut asunder in the plane joining its obtuse angles, and cemented together in the same place with Canada balsam. A ray of ordinary light then entering at A is split into two rays, one of which is totally reflected and thrown out at B, and we thus get the other alone at C, and so have a set of parallel vibrations, or, in other words, a ray of polarized light.




A Nicol's prism will then, in this way, give us polarized light by sifting out, as we may say, all the rays but those which vibrate in a single plane. In this respect we might liken the Nicol's prism to a grating which would only let a flat ruler go through in one way, and which, if a number of such rulers were pushed against it, would stop them all but the one which was in the same direction as its bars.

Here comes a curious result. Suppose two Nicol's prisms to be in line, one in front of the other, and exactly alike in position, then all the light which passes the first will pass the second, for, as we may say, the bars are parallel.

But now let us rotate the second prism 90 deg. around its axis, then all the light will be cut off; for the light which has gone through the first will be unable to pass the second, being, as we may say, perpendicular to the bars of the second grating. In other words, the bars are now crossed,

These actions I will now show you with the gas polariscope. In this box, C, I have a brilliant lime light, supplied with the gases through the tubes and stop-cocks, K, H. The lenses, D, collect a large quantity of light from the glowing lime, and throw it in a long conical beam through the opening in I.

At this point I place two Nicol's prisms, one before the other (not shown in the figure), and you see that as I rotate one of them about its axis the light on the screen disappears at every quarter revolution. We have thus the anomaly of two perfectly clear and transparent crystals entirely cutting off light.

But by means of polarization we can develop the most magnificent colors. (The Professor here proceeded to explain, by the aid of a number of very beautiful diagrams, the series of actions which lead to the development of color with polarized light. Without these diagrams, however, it would be quite impossible to follow the complex relations of this subject, though with their aid it was made most satisfactorily lucid by the enthusiastic Professor.)

I now introduce between the two Nicol's prisms a plate of selenite, which has been scraped to different thicknesses in reference to a determined pattern, and there, as we bring it to its proper position, you see it flash out as a ruby red rose, with a green bud and leaves. If now we rotate the second prism a strange alteration occurs. The rose becomes green and the leaves ruby red. (Great applause as the rose and its leaves exchange tints, and this figure is followed by a butterfly, which changes from blue to orange, while his spots are now yellow and again purple.)

In like manner with other figures. Here we have a lady's face white and adorned with a blue and red head-dress; but as we turn the prism, the face becomes black and the turban orange and green. So with this tulip and with these geometric patterns.

But here I have some large sections of natural quartz crystals, which will develop most splendid colors.

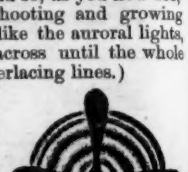
(The screen is all ablaze with a sheet of crimson, fringed with an irregular border of other hues, and then the crimson fades, or brightens, rather, into orange, yellow, green, blue, violet and every softest intermediate shade, with a lovely extacy of color which elicits round after round of enthusiastic applause.)

As I have already indicated, all these brilliant effects are obtained with crystals, because crystals have their particles in that condition of strain which is favorable to double refraction. If, however, we take some non-crystalline body, such as a block of glass, no such effect is produced, unless we produce in it artificially an irregular strain. Thus, I insert this block of glass lightly held in this vice, and all is dark; but now I close the vice, and light and color flash out in a beautiful pattern, which reveals the exact direction and relative intensities of the strain. I relieve the strain, and the light is gone; I again pinch the glass, and it cries out in color.

We can add yet another illustration of the connection between the crystalline condition and double refraction.

I place in the apparatus a glass plate coated with a solution which will presently crystallize. At first, all is dark upon the screen, but as each crystal forms it will allow the light to pass, and so, as you now see, we shall have lances of light shooting and growing across the screen. (Streamers like the auroral lights, but permanent, shot flashing across until the whole screen was covered by their interlacing lines.)

Perhaps the most beautiful of all the effects which we can produce are those obtained from cross sections of crystals. I will change the arrangement of my apparatus a little for this. (Lights up, and Professor busy with his lantern; lights down, and a black cross wreathed with a dozen consecutive rainbows on the screen.)



This is produced by Iceland spar. We turn the second prism, and lo! a white cross circled by rainbow rings. Then if I substitute a crystal of quartz you see the same rainbow rings, but in place of the white or black cross, the central space is occupied with color which changes to every rainbow hue as the prism is rotated. Now, in turn, we have a crystal section of nitre, which has two axes or centre lines

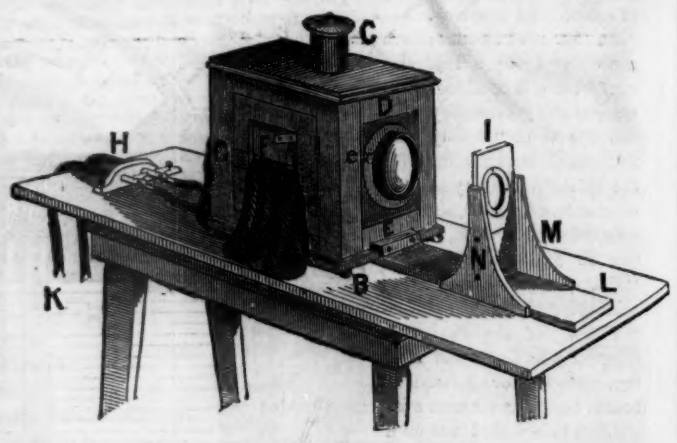



FIG. 9. FIG. 10.

of force (see fig. 9), and this, when the crystal itself is rotated, changes, as you see (fig. 10).

Lastly, I show you a combination of Iceland spar and quartz, which for splendor of color and delicacy of blending surpasses anything which you have yet seen.

I could conclude with no better *finale* than this, and will not, with poor and ineffectual words, weaken the pleasant memory which I may well hope this lovely *flower of light* will leave on every mind.

It is hardly necessary to say that the Professor's conclusion was received with as warm approbation as had been accorded to his efforts throughout, and that expressions of the kindliest interest and approbation were to be heard on all sides.

## The Gas Regulator.

Various circumstances connected with the distribution of gas cause the pressure of force with which it is expelled from the company's pipes to vary in such a manner as to occasion great irregularity in the supply to the consumer's premises—sometimes at one period during the evening there being just a sufficiency, and at another time a superabundance of gas. Under such conditions, continued attention is required on the part of the consumer to adjust the taps, in order to obtain the proper degree of light, or to prevent waste of gas, with production of smoke, and breakage of glasses. In other localities there is always a continuous excess of pressure, when, if improper burners be used, a considerable loss of the available light from gas is the serious consequence. These incoveniences are avoided by the use of the gas regulator.

This is a small self-acting instrument, generally attached to the outlet of the gas-meter at the entrance of the premises, and contains a suspended plug or cone, which opens or closes the orifice through which the gas passes in direct accordance with the decrease or increase of the pressure in the company's pipes. By this means the pressure in the consumer's premises may always be maintained at one uniformity, so long as there is a sufficiency of supply.

Regulators are of various constructions, but all embrace the principle just mentioned. Some are made so as to require oil or water for their action. The first possesses an inconvenience that after a length of time the oil congeals. The second is very effective, but requires to be placed in a situation of moderate temperature, to prevent the water freezing or evaporating. Others, called "dry" regulators, are made with a flexible partition of very thin pliable leather, which carries the suspended cone and adjusts the supply. This class of instrument is most extensively used for regulating the flames of the street lamps, and is becoming very much employed for consumer's premises. Another instrument of the kind is called the "Mercurial" regulator; wherein mercury is applied as the flexible medium. Many of this description, as manufactured by Messrs. Hulett & Co., London, have been in operation for twelve or fourteen years without requiring the least attention or repair.

The regulator, when properly constructed, fulfils the important office of continuously adjusting the supply, and whether one burner or all on the premises be lighted, it is equally effective, so that by the employment of proper burners, already alluded to, and by so adjusting the pressure that it shall not exceed four-tenths on the premises, the maximum of light is then obtained from a given quantity of gas, there is no irregularity in the height of the flames, there is no waste, and but little smoke. The economy derived by the use of the regulator must depend on circumstances, such as the pressure of the gas in the locality, the care previously employed in adjusting the lights, the kind of burners employed before and after using the instrument; but it is by no means uncommon for a saving of from 25 to 40 per cent. being effected by its use, and still retaining the same amount of light.

To obtain the full benefits of the regulator care should be taken that the pressure yielded thereby does not exceed that indicated; the most appropriate burners should be adopted to consume the gas, and the pipes on the premises should be sufficiently large, so as to enable all the lights to be amply supplied with the diminished pressure. There are some localities, although exceedingly rare, where the pressure is so weak and uniform as to render the instrument in question quite useless; but wherever the reverse happens, wherever there is an excess of irregularity in the pressure, then for the objects of economy and comfort the regulator is indispensable.

In all large establishments of several stories high, a distinct regulator is essential for each floor, inasmuch as gas, by its lightness, has a tendency to ascend, so that in the absence of this instrument there is often an excess of gas in the upper portion of a building, whilst the lower premises are in comparative obscurity.

Nevertheless, with all the various advantages enumerated to be attained by the use of these instruments, it very often happens that they are most unjustly condemned, for whenever a defect exists, such as a partial stoppage in some part of the consumer's fittings, or perhaps from these being too small, or more frequently through defective burners, the gasfitter, instead of taking the trouble to ascertain the defect and correct it, on finding a regulator on the premises, he at once attributes the fault to this, which is removed, and much to the prejudice of the consumer's interest. This should never be permitted, for although the instrument prevents an excess of gas to pass, on the other hand the pipes should be of sufficient capacity to permit it to be employed, and if any alteration be required to effect this, the increased expense would be trifling when compared with the economy to be derived. In the event of a proposition being made to remove a regulator, the party supplying it should be applied to, who for his credit's sake would see justice done to it. Hundreds of these instruments have been displaced from circumstances like these, bringing an amount of discredit upon them which they never merited, and causing consumers a vast unnecessary expenditure for gas.

The term regulator is, however, very often misapplied to arrangements which do not fulfil the object desired. Some of these are small vessels filled with tow, cotton, shot, etc., attached to the burners, which obstruct the passage of the gas when the pressure is great, but they likewise prevent a proper and sufficient supply under opposite conditions. Indeed, instead of economy resulting from their use, sometimes the contrary takes place, this arising from the consumer neglecting to pay that attention to the adjustment of the taps which he observed previous to their use. The term is also applied to the mode of adjusting the main tap by means of wires in comunication with a dial. Although useful, this demands repeated attention, and never ensures the economy and advantage to be derived from the regulators described.—*Richards' Gas Consumer's Guide.*

## Hard Water for Drinking Purposes.

Dr. Letheby, in an article on the water supply of London, states that water of moderate hardness, like that used in London, Paris, Vienna, and some other European cities, is always to be preferred to that which is entirely soft, as being best suited for domestic purposes, on account ot being brighter to the eye and more agreeable to the taste. He also makes the singular announcement that the French authorities are so well satisfied of the superiority of hard water, that they pass by that of the sandy plains, near Paris, and go far away to the chalk hills of Champagne, where they find water even harder than that of London; giving as a reason for the preference that more of the conscripts from the soft-water districts are rejected, on account of the want of strength of muscle, than from the hard-water districts, from which they conclude that the calcareous matter is favorable to the formation of the tissues.

Dr. Letheby further states that the mortality in England is greater, on an average, in places where soft water is used, other circumstances being equal, than where the water is hard; and it is suggested that the sparkling hard waters of the limestone districts are relished, not only because they are pleasant to the eye, but on account of some hygienic properties in the excess of carbonic acid they contain, and possibly because the percentage of lime acts medicinally upon the system. The Doctor concludes by expressing his preference for the very slightly hard water of London over a softer quality, although reprehending the use of water containing an excess of mineral matters.—*Harper's Magazine.*

## Subways for Gas Mains.

The use of subways for the reception of gas and water mains has more than once been advocated with much show of reason, as affording much greater advantages than the ordinary mode of simply burying the same under the pavement. Recently, however, when the question of providing such subways in one of the principal streets of San Francisco was under discussion, certain facts and theories were brought forward, tending to discourage the favorable view of the subway system previously held by many. These are due to the liability of leakage from the gas mains, and the mingling of the escaped gas with atmospheric air to form an explosive mixture. Casualties from this cause have led to the giving up of the plan in Paris, where it was at one time quite thoroughly tested. In one instance, that of the explosion in the gallery under the bridge of Austerlitz, which occurred some five years ago, four men were killed or wounded, and damage to the extent of upwards of fifty thousand dollars was caused to the structure.

It would seem that the difficulty referred to is one of that large class found in every department of technical practice, that are perfectly insuperable with neglect and carelessness, but easily overcome if met with some little attention and skill. Simple ventilating shafts would probably of themselves prove insufficient to keep an intricate system of subways from accumulating within them gases capable of exploding with tremendous power at the touch of a spark. But, if these shafts were furnished with suitable blast apparatus, the effect desired would be readily secured. With such apparatus there would, of course, be the attendant incident of daily expense, but this is also an incident with every attribute of a city in which engineering is called upon to meet the needs of its inhabitants. In the matter under consideration, the cost of ventilating the subways would at least be balanced by this, that the gas escaping from the mains would be discharged high in the air instead of permeating the soil, to issue thence to contaminate the atmosphere of streets and buildings.—*Am. Artisan.*

# Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily or publication, but as a guarantee of good faith.—Eds.

[Written Expressly for this Journal.]

### Peat—What and Where it is, and How to Discover and Test it.

BOSTON, March 10, 1871.

Messrs. Editors: Now that I have gone so far as to narrate something of the use of peat as a gas-producing fuel, and to give some general statements concerning the extent and free distribution of deposits of it, both in Europe and our own country, it may be well to stop and answer the enquiries which many are ready to make: What is peat? Where and how does it originate? Does it grow? Where is it to be found? and How can we distinguish it and test its qualities?

Singular as it may appear, wise men (!) seem to entertain widely different ideas as to what peat is, though no one can take the matter "in hand" and examine it without discovering very plainly just what it is; and it would seem evident, therefore, that the novel theories advanced by some, and the curious solutions of its mysterious origin gravely offered by others, could have had their origin only with those who had never ventured to make personal examination.

Peat is pure decomposed vegetable matter, generally occurring in low, moist localities, where the growth consists mainly of mosses, rushes, flags, coarse grasses, etc., in many cases of very rank growth; not unfrequently giving place, however, after ages of accumulation, to a subsequent growth of shrubs and trees. The deposit of peat so accumulated is evidently as pure vegetable matter as the wood in the trunk of a tree, impaired only by the fine dust which may have floated in the air and settled down upon and mingled with it, or the particles of earthy matter which may have been washed or blown into it from adjoining lands.

The process of decomposition is simply the earlier stages of carbonization or charring, which is progressing slowly but just as surely as though the same woody material were placed in the fire.

The origin of peat-beds and their formation is now generally accounted for somewhat as follows: In localities where the soil is retentive, like clay or marl, water collects, and unless the surface evaporation is very great, forms a pond; and in time, the water not being absorbed, stagnates and becomes covered with slime or a vegetable growth of a low order. Soon various kinds of aquatic plants, sedges, rushes, etc., make their appearance around the borders of this pond, and, by reproduction, gradually creep in toward the center, until the whole surface is covered. In process of time, after many races of them have succeeded each other—have grown, fallen and decayed—there is found to have accumulated a spongy mass, which is well adapted for the propagation of mosses, and ultimately for a composition in every respect similar to that constituting the various peat bogs as we explore them now. Gradually the accumulation reaches the surface and assumes the appearance of land, and as growth and decomposition proceed, increasing year by year in progressive ratio, a degree of solidity is acquired equal to the support of rushes, shrubs, bushes, and finally, trees. Occasionally this rapid and enormous accumulation exceeds the capacity of its original limits, and after acquiring a thickness or elevation above its boundaries, which its consistency is insufficient to maintain, must of necessity find vent, in which case it spreads over adjacent lands, which in time become a part of the general morass. Conclusive evidence of this exists in the fact that whole forests of almost every description—such as oaks, ash, birch, yew, willow, etc., have been overwhelmed in its gradual but steady advancement, and are found in all positions at the bottom of peat bogs, both in Europe and America.

It is very evident that the sites of many peat bogs were formerly occupied by lakes, but the peat has accumulated not only to the original level of the water, but has afterwards, by capillarity, risen to a considerble height above it, in some cases as much as twenty or thirty feet.

The strata underlaying peat bogs are very generally found to be of clay or marl, often times of superior quality and of no inconsiderable value. At the bottom of peat bogs is sometimes found a cake or "pan" as it is termed, of oxyd of iron; and bog iron ore in considerable quantities is frequently observed. This is accounted for on various theories, which we will not at present attempt to discuss.

Peat varies in color from light yellowish brown to black, and in consistency from that of bran paste to that of clay in the bank, its characteristics varying according to the difference in vegetable growth, climate and the endless variety of circumstances incident to the localities in which it is found. Some are composed of a congeries of vegetables in an organized state; in others few or no traces of organization can be seen. In some, clay, sand and shells may be detected: in others no such mixture can be discovered. Some are salt others acid and others still present no trace of either. Some are soft and unctuous like butter or cheese, and when manufactured form a hard, strong, tenacious fuel, almost like coal in consistency; others are loose, punk-like and friable like mould, and of comparatively little value for purposes of fuel. The water squeezed out of some peats is very nearly clear and colorless; from others it is of the color of amber, claret, or even black. The ashes of peat are alkaline in their character, and valuable for fertilizing and other purposes; they vary in color from white to yellow, gray and red, in all shades, according to the vegetable growth from which they originate.

The prevailing growth in most peat bogs is a rich moss which none can fail to have observod who have walked over it. It is of the genus *sphagnum* and has the peculiar quality of dying at the extremity of the roots, while it continually grows and increases above the surface.

As excavated from the bog, peat has generally the appearance of a tubular celular mass of mud, generally dark brown or black, the cells being principally formed by the strawlike remains of the stems and stalks of the vegetable growth from which, year by year, it has been formed; these cells and tubes occupying a very considerable portion of the bulk of the mass and being filled either with water or air or both. Although possessing the same general features, peats differ in structure and characteristics as much as do the various kinds of wood and coal.

If cut from the bog in lumps of any convenient size and left to dry with its structure undisturbed, the mass will generally retain its form; in some cases with a good degree of strength and solidity, while in other cases it will be found to be exceedingly friable, and so loose in texture as hardly to bear handling. It is after this simple method of preparation that it has generally been used for centuries in Europe, and in numerous localities in this country, from its earliest settlement. But during the last fifty years numerous attempts have been made to prepare it in some better manner, the aim generally being to solidify it, rendering it thereby a more serviceable fuel, and in better condition for handling and transportation. Many of these attempts were unsuccessful; but in this country remarkable progress has been made during the last few years, until now there is no difficulty in producing any amount of excellent fuel from our peat bogs, at very moderate cost, and in good shape for traffic and use.

In subsequent letters I will speak more particularly of the process and machinery by which this is accomplished: but at present it is sufficient to say that the means and appliances are simple and comparatively inexpensive, and the fuel can be produced in large quantities, of prime quality and in good shape, at a cost for labor of less than two dollars per ton; while as to its comparative value it is freely acknowledged that a ton of it is fully equal to a cord of best oak wood sawed, split and ready for use, or from two-thirds to three quarters the value of coal, while for some purposes it is equal to coal, and for others it is superior.

Peat is generally found in climates of a moist nature, in level countries where imperfect drainage exists; although occasional and sometimes extensive deposits occur in upland districts. In mountainous regions, in addition to the imperviousness of the rocks to moisture, the constant formation of clouds upon the more elevated points favors the growth of the mosses and plants, the decomposition of which, contributes annually to the increase of these deposits. In America peat is occasionally, though rarely, found in these elevated positions, but in Great Britain and on the Continent the deposits are numerous, often extensive, and as a general thing are esteemed of superior quality for fuel. Instances of this kind are frequent in Scotland, Ireland, Northern Germany and Holland, while others occur high up the Alps, in the Vosges and in the Jura mountains.

From its physical constitution this substance may be regarded as a kind of fossil fuel, and is probably one of the most extensive and freely distributed sources of fuel known; and it is matter of no little surprise that it has not already been much more freely used, though the lack of the proper understanding of how best to prepare it for use, which is now entirely obviated, has doubtless been the prominent cause. Numerous authorities refer to it as akin to coal, some even asserting that it does change to coal. It certainly may be said that the process which has operated to convert countless reproductions of plants into peat bogs has been similar in the case of coals, to some extent; but geologically considered, it is evident that the oldest peat formations are of modern formation, as compared with the most recent beds of coal.

The more important characteristics of any peat may be easily ascertained and tested by any one. After removing the undecomposed surface to the depth of perhaps eight to twelve inches, the pure peat is discovered, of which take any quantity, large or small, and with a trowel, hoe or any convenient tool, work it over and thoroughly mash and kneed it until it is of the consistence of mortar; then form it into cakes or blocks of any convenient size and shape, and place them in the open air or elsewhere (not exposed to frost) to dry, and when dry you have peat fuel. To ascertain its qualities you may test it precisely as you would any other fuel; put it in the fire and burn it; judge of its durability, the clearness and intensity of the heat, etc., etc.

The purity of the material is easily ascertained by weighing a given quantity prepared as above, and then burning it under such circumstances as to retain the ashes, which may then be weighed and their percentage as compared with the original weight of the dry fuel, is easily computed. Good peats ordinarily show a residuum of ash amounting from five to eight or ten per cent. of their dry weight, while some are so pure as to show no more than two and a half to three or four per cent.

Of the properties of any peat for gas (illuminating) purposes, a very good impression may generally be formed by observing the volume, duration and brilliancy of the flame produced, which, of course, is nothing more than the combustion of the gas evolved, and which, if purified and passed through a pipe and burned as it should escape from the end of it, would serve for illuminating purposes.

My next letter will refer more particularly to the methods and appliances for preparing peat for fuel.

Very respectfully,

T. H. Leavitt.

### Answer to "W" on Dip-Pipes.

Messrs. Editors: In the last number of your journal, "W." gives an ingenious explanation of the effect produced by the dip-pipe in the manufacture of illuminating gas; but we think he has failed to fully account for the back pressure upon the retort, which is caused by it. In the action of the dip-pipe, we are not to consider simply the displacement by the flow of gas from the retort of a column of liquid half an inch, more or less, in height; for the liquid contents of the hydraulic main, when the retorts of the benches connected with it are in operation, take on a vibratory motion, and each dip-pipe gives rise to a series of waves, causing the liquid to rise above and fall below its level when at rest; so that, though the dip of the pipes may be only half an inch below the water line, a depression of several inches may at times be necessary in order that the gas from the retorts may escape into the upper part of the main. That such is the case, may be shown by applying the ordinary pressure guage to the stand-pipe or bridge-pipe. In making the application, care should be taken in placing the guage that the current of gas in its passage by the end of the guage, inserted in the stand-pipe or bridge-pipe, does not reduce the pressure by causing a partial vacuum in its shorter limb. X.

### Answer to "Inquirer" on the Durability of Wet Centre Valve Covers.

Philadelphia, March 7, 1871.

Messrs. Editors: We noticed the communication of "Inquirer" in your last issue, respecting the durability of "Wet Centre Valve Covers," and would state that during the past ten years we have made several with a 12-inch composition band of tin and lead around the outside, at the water line, which has prevented the rusting of that portion of the outer body, and caused them to last about double their usual time.

The same quality of tin plate used in wet centre valves, varies in its durability, according to the different character of the water used in different locations. This part of a gas works is the first *weak spot* in the machinery; and when *leaky*, causes derangement in the purification, and much annoyance to consumers in consequence, and only remedied by repair or renewal. Many of the larger works keep on hand a duplicate centre valve to use at such times, as thus only can the manufacture of gas proceed without interruption.

The best remedy is the entire abandonment of the wet centre valves for the dry centre valve. The cost of the latter is about half the former, and with the necessary fixtures on the ground, the change can be made in two days, or as long as most works can suspend the making of gas.

This valve is a permanent improvement in a gas works, and entirely free from annoyance or anxiety, beyond occasional lubrication of its face, and when properly fitted up and connected, is free from leakage.

We have furnished over one hundred, of sizes from four inch to twenty inches, to the gas works of the United States, Canada and Cuba, and wherever used, gives great satisfaction. Most new works now building are being supplied with the dry centre valve.

Respectfully yours,

H. Cartwright,

Vice-President Am. Meter Co.

[See their advertisement on page 86—Eds.]

## Prof. Tyndall on the Water Supply of London.

At the Royal Institution, on Friday Fvening, Jan. 19, Professor Tyndall delivered a Lecture upon the "Scattering of Light," which was, in point of fact, a discourse upon domestic water supply. The learned professor commenced by exhibiting the impurities of London air, the motes of a sunbeam, by the light of the electric lamp, and explained to his audience that what they saw was not air, but suspended particles, capable of being dissipated or removed, and that, when so removed, the track of the beam through the air itself would be invisible. He next related that he had accompained the eclipse expedition to Oran, and that on his return, having been disappointed as regards the special object of his journey, he had sought to turn his opportunities to account by investigating the causes of the varying tints presented by sea water. He described the way in which a series of 19 bottles had been filled between Gibraltar and Spithead, and the results of an examination of them by the electric light. The bottles were themselves on the table, but were not placed in the beam before the audience, since the original differences among them had been diminished by subsidence. The general tendency of the examination was to show that the yellowish water of coasts and harbours held in suspension a large quantity of particles; that the particles in the green water were less abundant and in finer division; and that the blue water of the deep ocean was comparatively free. Professor Tyndall explained the blue or even blue-black of the depths, by displaying the prismatic spectrum on the screen, and by quenching it, at first partially, and with regard to certain colours, and afterwards absolutely, by a succession of cells of increasing thickness, containing a solution of permanganate of potash or of sulphate of copper. He said that when a beam of light entered the sea, the heat rays were absorbed by the surface, the red rays by a very superficial layer of water, the green rays next, and ultimately the blue. If, however, the light encountered particles, these would reflect the green rays to an observer; while, in the absence of particles, the green rays would continue their course till they were wholly quenched. Water of great depth and absolute purity would thus appear entirely black, like a sea of ink, and would reflect no light beyond a glimmer from its surface. The professor exhibited a white dinner-plate, to which a rope was attached, and which he was in the habit of having cast overboard and towed from the *Uryent*, and which always appeared green, and he also described the appearances seen on looking down the screw-well of the ship, so that the water was seen by turns green—with the screw-blades as a background—and then dark blue, with the ocean depths for a background. The white plate, which appeared as a green object when towed under water, would, he said, if ground to powder and scattered, cause the portion in which this powder was suspended to return a general green reflection. Having in this way established that the visibility of the track of a beam through water depended upon particles by which the light was reflected, Professor Tyndall next placed before the electric lamp a succession of nine bottles, containing samples of the water supplied to their customers by the various London water companies. The turbidity revealed was in every case sufficient to make the audience regard water as a very undesirable beverage. That of the Lambeth Company displayed pre-eminence of a bad kind: that of the Kent Company was by far the clearest; the West Middlesex Company stood second in order of merit,

and among the rest there was little to choose. With a reticence more eloquent than words, the lecturer avoided expressing opinions about the dirt that he exhibited; and he also expressly mentioned that pellucidity was no proof of the absence of soluble impurities. He also showed that to cleanse water from suspended dirt was a very difficult matter; and exhibited four specimens of distilled water, a specimen once filtered by Mr. Lipscombe, a specimen that had gone through a silicated carbon filter, and a specimen four times filtered through bibulous paper in the Royal Institution Laboratory. These were clear when compared with the water of the companies, but the track of the beam was plainly visible in all. A specimen of water from the Lake of Geneva was then exhibited in illustration of great natural purity, and here a faint blue line only could be seen. This brought Professor Tyndall to the practical conclusion at which he had been aiming—namely, to an account of the water supply yielded by the English chalk formations. He characterized this as being of the greatest attainable purity, inexhaustible in quantity, and easily accessible for the supply of the metropolis. He described its natural hardness as being such as to render it unfit for domestic use, but explained that by Clark's process this hardness could be entirely removed at the central works, and that the water might be delivered in London at a uniform temperature, free from organic impurity or suspended particles, and so soft as to be perfectly adapted for all household purposes. He described Clark's process, and illustrated it before the audience, and finally showed actual results by producing a bottle of water from Canterbury, derived from the chalk, and softened in the manner described. By the side of this was a similar bottle containing the water supplied to the Institution, and the two were illuminated together by way of contrast. The difference was like that between pea-soup and crystal. Professor Tyndall then read a portion of the report made some years ago by the late Professors Graham and Miller, and by Professor Hofmann, upon the admirable qualities of this chalk water, when artificially softened, upon its fitness for the supply of the metropolis, and upon the impolicy of allowing it to pass into private hands, and concluded by saying that every word that he had read he desired fully and cordially to endorse.

[The following curious comments upon the highly interesting lecture reported as above, we take from our contemporary, the *London Journal of Gas-Lighting*. We shall not speculate on the general *animus* of this rodomontade, nor do we feel called upon to defend Dr. Tyndall. The local importance of the controversy and the conflicting interests involved in this special case, do not extend to our readers; but we wish to take the occasion to call attention to the illustration presented here of a sanitary imbroglio whose various phases we are yet to pass through in this country, and which must needs occupy greatly the thoughts, time and labor of many of our most skilled chemists. We refer to the questions of wholesome water-supplies to many of our great growing communities. Our columns fuenish the natural vehicle, and the only appropriate one, for the discussions and investigations on thess subjects, and it is our intention in the future to make this subject of water supply a specialty.]

"Just as, twelve months ago, he frightened his audience by showing that the cloudy appearance seen when a beam of light from the electric lamp is sent through the air, was caused by the presence of solid particles in the atmosphere, so, a fortnight ago, he produced a similar effect on his hearers by exhibiting the opacity rendered visible in water apparently clear when subjected to the same test. The inference was irresistible, that air and water—that is, most waters—are alike pervaded by solid particles, the noxiousness of which was more than insinuated.

We have said most waters, for, in fact, the different London waters showed the opacity in very different degrees. The New River and West Middlesex exhibited the least, the Lambeth and Chelsea the most, while the Kent Company was almost completely transparent. The last-mentioned fact introduced the point of the lecture, which was, that water from the chalk is best fitted for human consumption. Not, however, in its natural state, for it was further shown that, after softening by Clark's process, such water was rendered perfectly transparent. Hence the Professor advocated the supply of London with water from the chalk, softened by Clark's process. We may mention, in passing, that the much vaunted Loch Katrine water showed almost as much opacity as the most turbid Thames water—a fact which will probably give the *coup de grace* to any scheme for supplying London from a lake district.

Beyond the application of the electric lamp, there is nothing at all novel in Dr. Tyndall's observations. Every one who has been in the habit of observing waters through a two-foot tube is well acquainted with the varying color and turbidity of most London waters, and the clear blue color and transparency of chalk water, especially after softening. The disingenuousness of Dr. Tyndall is too remarkable to be passed over. Last year it might have been supposed from his lecture, that no one before had had the slightest notion that the atmosphere was loaded with solid particles. This year it might have been inferred that no one before had dreamed of making an optical examination of water. The two-foot tube, however, is in constant use by water analysts, and the appearance revealed in the tube is precisely identical with that produced by the electric light; the one being a simple and practical test, the other a striking illustration for a clap-trap lecture.

"Into the larger questions—first, as to the fitness of softened chalk water for human consumption; and next, as to the possibility of obtaining an adequate supply for London from the chalk—Dr. Tyndall did not enter. The Royal Commission on Water Supply gave some attention to the latter question, but limited their calculation to the chalk district to the south and southeast of the metropolis, from which they estimated that a daily total of thirty millions of gallons might be drawn—just a tenth of the quantity it is reckoned London will in a few years require.

"The question of the adaptation of softened water for a supply is not so easily answered. Rich as are the opportunities in this country for an inquiry into the influence of a water supply on health, such an inquiry has never been made, and we have only the more or less crude conjectures of some medical authorities, who are, however, almost unanimous in recommending a moderately hard water as the best for human consumption. This opinion is well supported in an able letter, signed 'Biologist,' published in a recent number of the *Times*.

"Returning for a moment to the complaints of carelessness in filtering, we must mention that Dr. Tyndall showed that after the water had passed through one of Lipscomb's filters, the appearance was but little improved—a circumstance which goes far to exonerate the companies from the charges brought against them. Further, it must not be forgotten that, although bright, the chalk waters are, as regards 'previous sewage contamination,' in a worse state than the polluted Thames and Lea waters."

## Boiler Explosions.

The explosion of a steam boiler is *prima facie* evidence of carelessness in its construction, or in its use. It is so regarded by the engineers, and ought so to be regarded by the law. It will be easy to convince any one who will examine the records of boiler explosions and inquire into the means of preventing them, that no injustice would be done to the owners of boilers by indicting them for criminal carelessness in all cases of explosion.

The history of boiler explosions is authentic and definite. The boiler has usually been erected under the full light of modern science. All the attending circumstances of the explosion have been immediately communicated to the public; curiosity has aided science in making every man an investigator of these circumstances and a searcher after causes; public and private commissions have been appointed to examine the subject generally; numerous legal tribunals have gone to the bottom of special cases, and innumerable private professional observers have witnessed results, searched records, weighed evidence, and arrived at general conclusions. All the plausible theories of explosions have been not only looked into, but worked out, in many cases, experimentally or theoretically, to their ultimate limits.

Now the remarkable and unprecedented result of all this investigation is, not the division of any large body of experts into schools; not the building up of rival theories, but the universal conviction of all concerned, that boiler explosions are certainly in most, and probably in all cases, the result of malconstruction or maltreatment, and of nothing else, and that the usual immediate cause is the unchecked deterioration of the boiler in service. In the great majority of cases the evidences of carelessness are as plain as the time of day on the face of a clock—a sheet furrowed nearly through; a stay bolt rusted off; a crown-sheet insufficiently supported; expansion and contraction unprovided for; water connections stopped up; bad material—some one of the many obvious and certain conditions of rupture. In a few cases the immediate causes are not apparent, and then the electricity theorists, and the gas people, and the mystery men fight over the remains in the newspapers; and the only reason why simple neglect is not discovered to be the cause, is that the parts of the boiler which would otherwise reveal it, are blown away, or are too much mutilated or obstructed to be legible. Simple bad treatment by the maker or user will account for the original rupture which ends in any explosion, however terrific may be its effects. There is force enough restrained within every steam boiler running to-day to perform the most terrible work of ruin that any similar boiler ever performed in exploding. When this force is once released, the amount of destruction depends on the point of rupture, the resistance, the surroundings, and on an infinite number of circumstances, mostly outside of our control. The only thing we can do, and it is enough, is to keep the resistance superior to the normal pressure.

Now that the causes of boiler explosions are so well understood as to be a matter of commercial calculation—where companies make money by insuring such boilers as are constructed and maintained according to established professional rules—it is to be regretted that the government should stand helplessly by, and see scores of people scalded to death every few weeks, for the want of an adequate law and a system of inspection. Boiler insurance and inspection companies and they are no new or experimental thing—simply prove that boilers constructed and maintained according to certain well known rules, are practically safe; that the chances of explosion, even with ordinary water-tending, are very remote, and they stake their money on this knowledge; and yet the United States Government has been unable to even check the increase of these disasters. If Congress cannot at once provide for the security of the public against boiler explosions, it had better let out the job of protecting its citizens to some insurance company, and then it will be done on scientific principles, and by competent men.—*N. Y. Times.*

## The Darien Ship Canal.

The first intelligence by mail in reference to the Darien Exploring Expedition has reached Washington. The United States steamship Resaca, which was ordered to take the place on the expedition of the wrecked steamer Saginaw, arrived at Panama on the 20th January, having sailed from Callao on 13th January. The six midshipmen sent to San Francisco to join the Saginaw, and proceed in her on the Darien Expedition, have been ordered to Panama to await the instructions of Commander Selfridge. The Nipsic, which had arrived at Aspinwall on January 26th, sailed on January 28th for the mouth of the Atrato river. The recent report that a practicable canal route has been discovered, was based upon a story that a party of Indians had come up to Aspinwall with a sick sailor, and bringing a letter from Commander Selfridge, announcing that he had laid down an interoceanic canal route, with a short intervening ridge of only 300 feet elevation. To whom this letter was addressed is not stated, and the whole report must have originated in the stories circulating among the members of the expedition and their anticipations as to ultimate success. The storeship Guard, with Commander Selfridge, which sailed from New York on December 3, 1870, arrived in fourteen days, at Carthagena, at the mouth of the Gulf of Darien, endeavoring to secure a party of "machete" or axe men to cut the line ahead of the surveyors. The parties on the Atlantic side are to commence running the line from various points, and to meet the party proceeding along the Atrato river from the Pacific. Commodore Selfridge was expected to arrive at Panama on February 5th. It will be seen that surveying operations could not have been commenced at the date of the alleged report.

A letter from an officer of the Guard, dated 1st January, states that Commander Selfridge, having succeeded in procuring sixteen "macheteros," about December 27, 1870, sailed for the Gulf of Uraba, at the mouth of the Atrato river. On December 31st, 1870, the first exploring party left the ships with instructions to proceed to the junction of the Cacarica with the Atrato, and to carry the survey from that point up the Cacaria to the Paya trail.—*Railroad and Mining Register.*

## Smedberg's "Synopsis."

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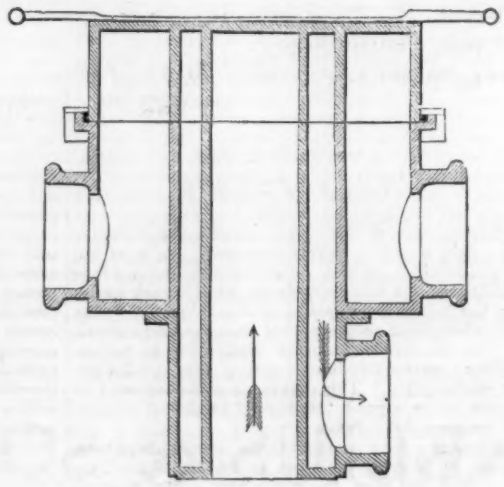

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[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

THURSDAY, MARCH 16, 1871.

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## General Editorials.

### ON THE CONSTRUCTION OF FURNACES.

The construction of furnaces, and the proper regulation of temperatures, where much heat is required, is a subject demanding the closest attention. Not only from economical consideration as regards the quantity of fuel used, but also on account of the variable effects likely to be produced on the article which may happen to be undergoing the process of manufacture—this subject should be attentively studied, and to do this requires no small degree of application. To state that at present furnaces, ovens, and other appliances for submitting substances to an elevated temperature, are not uniformly constructed to obtain the requisite degree of heat, and at the same time to economize in fuel, would be merely the announcement of a fact patent to the minds of all who have had any experience in the management of manufacturing establishments.

The proper regulation of temperature in the retort oven, is a matter of great importance to the gas-engineer, and as the first operation in the generation of gas falls strictly within the province of this subject, it should be thoroughly understood. The construction of the retort house in many works, is essentially similar, and to all external appearance, a plan of management adopted in one, would do for others. But it must be understood that a very slight and imperceptible difference in the arrangement of the interior of the oven—the placing of the tiles, the form of the flues, the configuration of the stack—all these may vary in some particulars, and materially change the uniformity of action which might be otherwise anticipated. It being impracticable—in fact almost impossible to build a furnace whose exact consumption of fuel and results of its combustion can be predicted with certainty, these data can be obtained by practical essays alone; and only after actual work has been performed, the capability of the furnace becomes known.

In the substitution of clay for iron retorts, much attention should be paid to properly conduct the preliminary essays, by regarding the construction of the ovens, the corrrect disposition of the tiles, and the arrangement of the flues.

The different modes of setting these retorts, each of which has its advocates, should be carefully studied, and the effect of the same, when in actual operation, should be accurately noted. Very much of the efficacy of clay retorts—indeed the whole question of their value—depends upon their being properly placed in the oven, and the flues being suitably arranged so as to produce the largest possible effect with an economical use of fuel. We have known instances where clay retorts have been introduced, and placed in the oven without paying a due share of attention to the proper arrangement of the supporting tiles, and the conseqnence was, a very poor opinion respecting their merits, by the experimenter, until the true state of the case having suggested itself, the defect was remedied, and the real value of the retorts was fully proved. We have since then heard of several instances in which clay retorts have been condemned, after apparently faithful trials, and the use of iron resumed, and yet after such universal testimony in their favor, who can doubt but that the causes of the difficulty lays not in the retorts themselves, but in the construction of the oven and the arrangement of the tiles. This must be the true solution of the dilemma, for while such abundant testimony can be advanced in favor of clay retorts, and their superiority over iron is so fully asserted, we have known but of few instances where they have not not been adopted, after careful experiments, to test the question of their comparative value.

### OXYGEN FOR PURPOSES OF ILLUMINATION.

The following, which we clip from the last issue of the *Journal of Applied Chemistry*, furnishes us an appropriate text for some brief remarks on this subject which are suitable to the times:

"OBJECTIONS TO PRACTICAL USE OF OXYGEN IN ILLUMINATION.

"We have referred on several occasions to the use of oxygen as an illuminator on a large scale, and to the many advantages claimed for it by the inventors of the different processes. It is now stated, on the other hand, however, that the entire process of manufacture has many grave practical difficulties, especially in regard to the preservation and the distribution of the gas; since iron reservoirs and pipes, especially when moistened, are so liable to be attacked by the oxygen as to be soon rendered useless, thus requiring some new material for this purpose. The illuminating apparatus also requires to be totally changed, and unless the mixture of oxygen is made with the greatest exactness, the idea of the economy of the illumination is illusory. Furthermore, the intensity of the light is very variable, according as the oxygen is more or less mixed with air and moisture. So far as it regards the economical introduction of this method of illumination, the ordinary gas companies are assured that they have nothing to fear from competition."

With regard to the intimation conveyed in the last sentence, which is the point in this paragraph most directly of concern to the mass of our readers, that Gas-Light Companies might, could, would, or should be interested in withstanding, or be brought into competition with, the introduction of oxygen gas into public use, we are obliged to differ from our esteemed contemporary. As we understand it, the most important use of oxygen would be as an auxiliary to ordinary coal-gas; to enhance, in a manner similar to that in the old fashioned "Bude Light," still in use, we believe, in some light-houses, the brilliancy of gas-flames, as well as other flames, for some special purposes, as in the lighting of public places, such as streets, parks, theatres, etc., etc. From this point of view the introduction of oxygen gas into use, if practicable, is certainly of interest to all of us; and we wish here to express the hope that anything that may be said, *pro* or *con*, that is founded on reliable experiment, or on strict scientific considerations, may be communicated for the behoof of our readers. The experiments have certainly been in progress long enough here in this city to furnish practical results of an important kind, and we shall not grudge our columns for the communication of any such. In this connection we are gratified to announce that that most accomplished experimenter, Prof. HENRY MORTON, is about to conduct some tests of these methods of illumination at the new STEVENS INSTITUTE in Hoboken, accounts of which we trust to procure. As to the above objections on the score of the non-adaptability, as stated above, of the present systems of holders, mains, etc. to the storing and convection of oxygen, it will doubtless be replied that it is not proposed anywhere to substitute the latter for coal-gas (at least if it is, we beg to enter a slight remonstrance *to this*.) The mode now in general use, is to store and transport the oxygen in a state of compression in strong cylinders; and it is easy to ensure that both these and the gas itself shall be dry. If the time shall come when its consumption shall be so great as to justify a special system of service-pipes, new materials and methods suitable therefor will doubtless at once turn up, or be turned up.

H. W.

## MOTHER NATURE'S GAS-WORKS.

The Editor of this Journal, as will doubtless be well remembered by its readers, published in these columns, just *one year since* this day, an article recording some observations upon one of a class of natural phenomena very common in this country, the importance of which has been far from receiving, hitherto, the recognition, even among men of science, that is soon to be accorded to it. This article was upon "A New and Extraordinary Gas Well in the State of New York" (at West Bloomfield, Ontario Co.) This article, followed by others from the same pen, (See Issues of April 2 and 16, 1870 pp. 104 and 121), was extensively copied, and appears to have attracted great attention to the general subject of American Gas Wells; several accounts of others, in Knox County, Ohio, Erie, Pa., and elsewhere, having since been circulated. Arrangements, it is stated, have lately been made to light the town of Lima, eight or nine miles distant, with the gas of the Bloomfield Well.

At the time of making the report above referred to, on the Bloomfield Well, and since, the writer has stinted nothing in his expression of his views, in conference with such as have manifested interest in the subject, as to the immense future importance of these fountains of natural gaseous fuel. Referring to the Bloomfield Well, he then said: "In a country and an age like this, such a fountain of heat, power and light as this, cannot be allowed to run long to waste. Many problems have arisen out of the consideration of the best modes of utilizing it, upon which I have been engaged for some time, and the results of the investigations and calculations are very curious and surprising, but not yet ripe for presentation," and so on. The problems referred to relate to the modes of purification, confining, conveying and enriching of these natural gases, and apply of course generally to all such gas-wells. The gases evolved by them in such stupendous volumes and with such inexhaustible flow, differ in many important respects from ordinary coal-gas, and both admit and require *very different* management, to render their handling and utilization most economical and advantageous. These problems have received a large share of the time and labor of the present writer in the interim since his West Bloomfield investigation, and his results have been the origination of very remarkable and valuable devices for accomplishing their solution.

The *Geology* of the subject has not been neglected by him, and it will set forth in a strong light the assertions that have been here for the first time distinctly and boldly put forth before the public, as to the commanding importance of this subject in the near future, to say that it may be accepted with the most implicit confidence as a fact, that there are vast districts of country throughout the United States within which, by *judicious* exploration, an immense number of such fountains of natural gas may be developed; furnishing a fuel which *raises itself* out of the mine, and which may be made to transport itself, up hill and down dale, to any point required; independently of seasons and circumstances, miners' strikes and railroad monopolists to the contrary notwithstanding. A future lies before this new art of developing the gifts of Mother Nature, big with a promise for which even the wondrous history of American Petroleum Production has furnished no parallel.

All who have the disposition, means and leisure to assist in developing and realizing these new ideas, are invited to send communications to the office of this Journal. H. W.

## New Gas Works in the West.

Minneaopolis, Minn., has recently had put in operation a gas works. The main building is of stone, with a slate roof. The retort room is thirty-five by twenty-five feet; the condensing room twelve by twenty-nine feet; the purifying room is twenty-three by twenty-nine, and contains four purifiers six by six feet, with centre seal, etc. The tank building is fifty-six by eighteen feet, containing a gasholder fifty by eighteen, with a capacity of 25,000 cubic feet.

We are informed the works are complete in every particular, and give infinite satisfaction to the public who are "in search of light," and is creditable to the Providence Steam and Gas Pipe Company of Providence, R. I. (we understand this company established a branch house in Minneaopolis), who are the contractors. The masonry was done by Mr. Geo. McMullen and the woodwork by Messrs. Harrison Bros of Minneapolis.

There are 27,000 feet of gas main, cast iron, and 5,400 feet service pipe, The company was organized February 25th, 1870. President, Hon. D. Morrison; Treasurer, W. P. Westfall; Secretary, Geo. A. Rust; Superintendent of Works, J. H. Rollins. Capital Stock, $100,000. Price of gas, $5 per 1000 cubic feet. The coal is transported all the way from Pennsylvania, and cost $12.50 delivered.

We think the recent discovery of what is said to be a good quality of bituminous coal, near Granite Falls, Renville Co., on the Minnesota river, will be likely to engage the attention of the gas companies of Minnesota, consisting of St. Paul, Minneapolis, and Winona, which latter place is now establishing a gas works.

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We herewith acknowledge the receipt of a copy of the above named work from Messrs. Harris & Brother, who distributes them gratuitously to the various gas companies every year. With the view that it may reach others outside the gas companies, Mr. H. Carey Baird has been permitted to publish the same. It contains many useful hints to those engaged in the management of gas works, and would recommend it to the notice of gas engineers, as few are gifted with a memory so retentive as not to require the aid of written formulæ in working out the numerous calculations constantly necessary in their profession

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T. C. S. of Ind.—We cannot answer your question as we are entirely unacquainted with the merits of the case. The party you name is the proper one to whom to apply for information.

J. R. of N. J.—The earliest English patent connected with the distillation of coal tar was granted August 19th, 1681, to John Joachin Becher and Henry Serle, for "a new way of making pitch and tarre out of pit cole, never before found out or used by any other, which being put into practice may be of great advantage to our subjects in generall."

J. W. T. of Ind.—You will have to brighten up your mathematics a little. In order to properly comprehend the flow of gas through pipes, you must be readily conversant with the extraction of square root and sundry algebraic formulæ. The laws of the distribution of gas through mains are very regular, and you should make it your business to thoroughly comprehend them.

H. G. of Springfield.—As has already been suggested in our columns, respecting the new purifying composition of Messrs. St. John and Cartwright, those applying early will stand a better chance of obtaining prompt supply.


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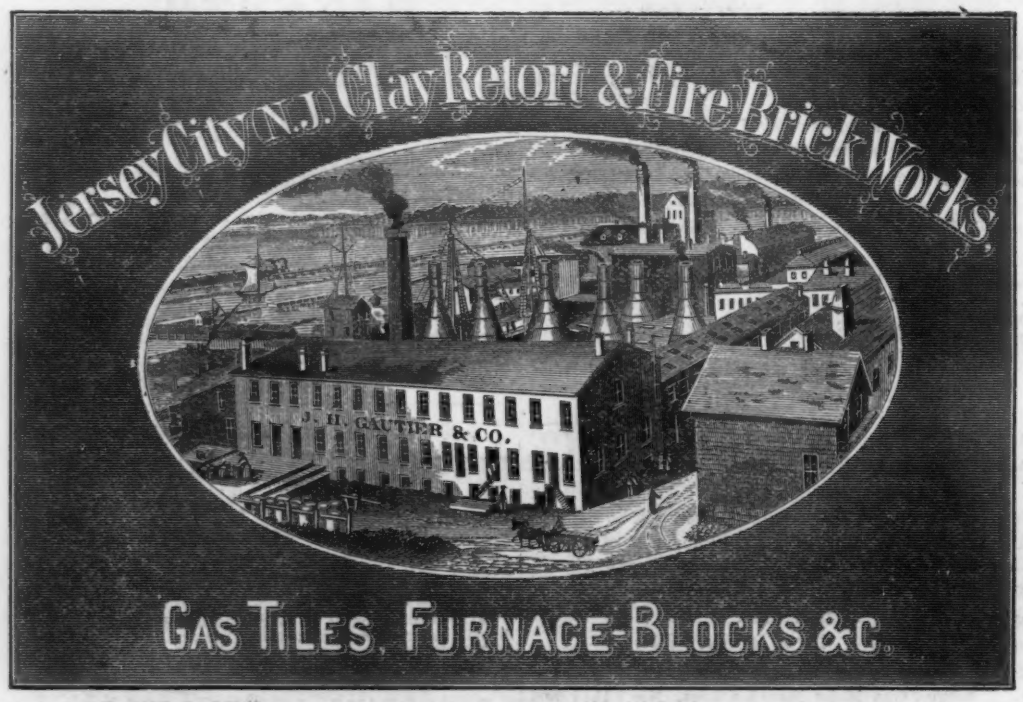


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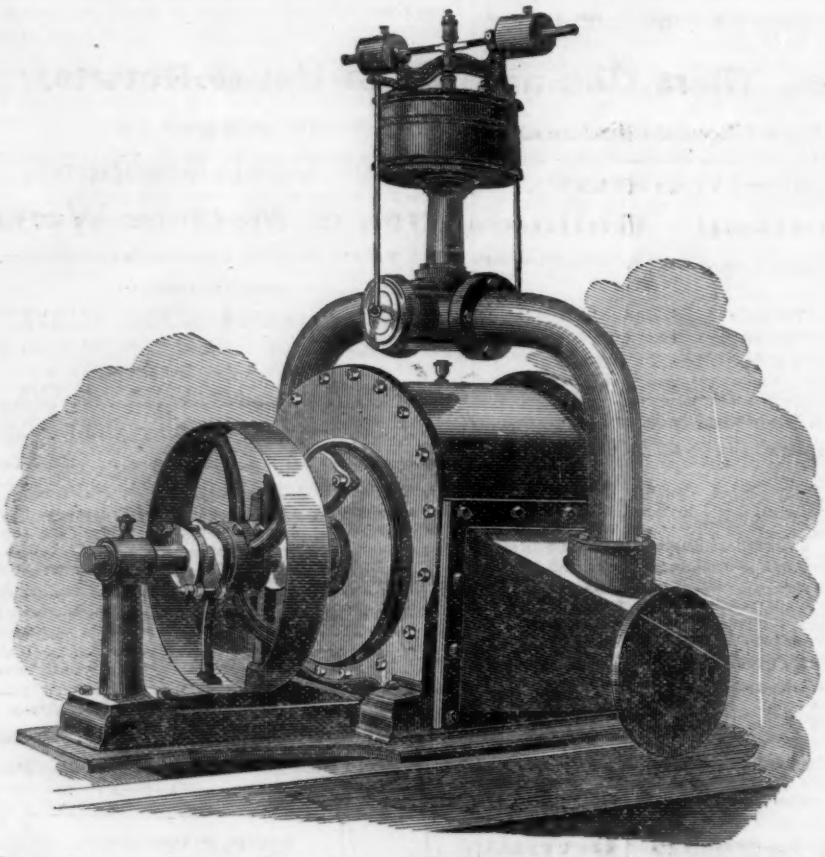

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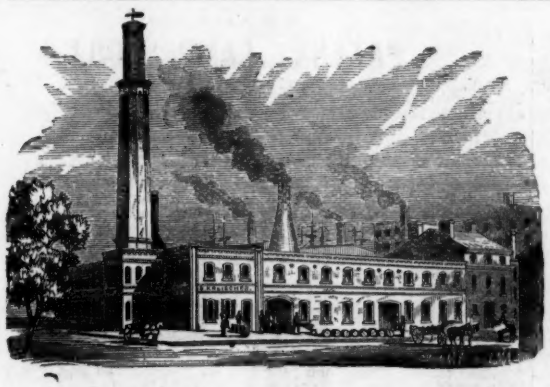

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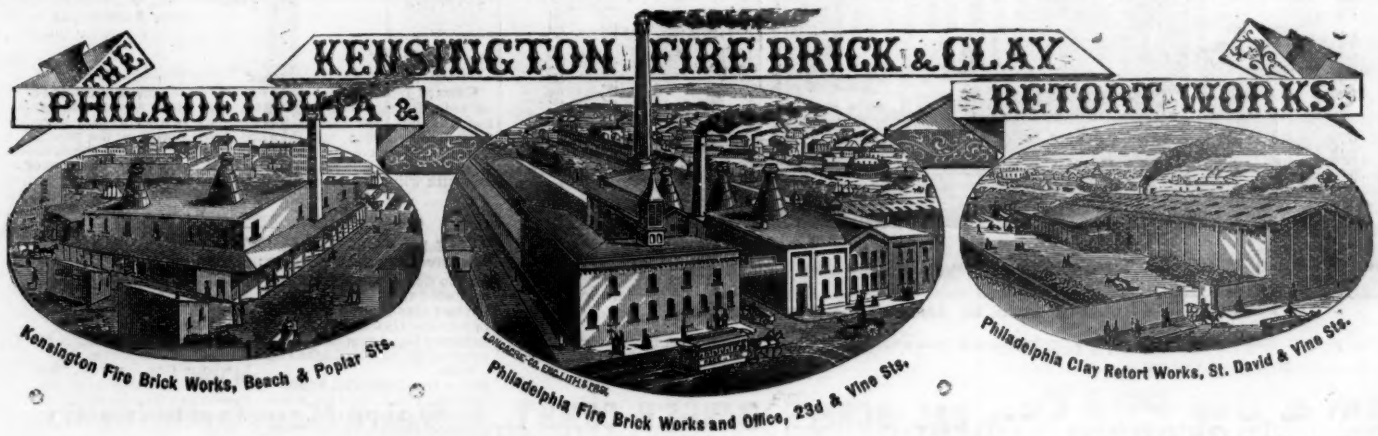
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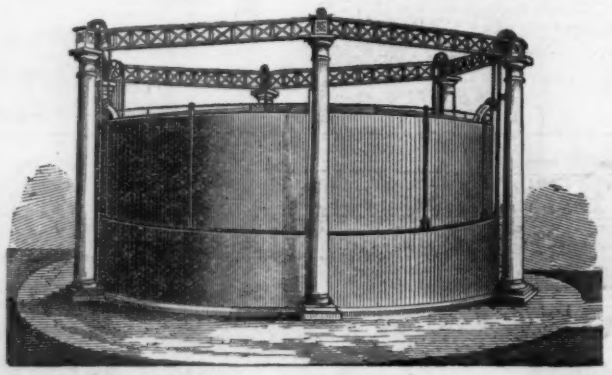

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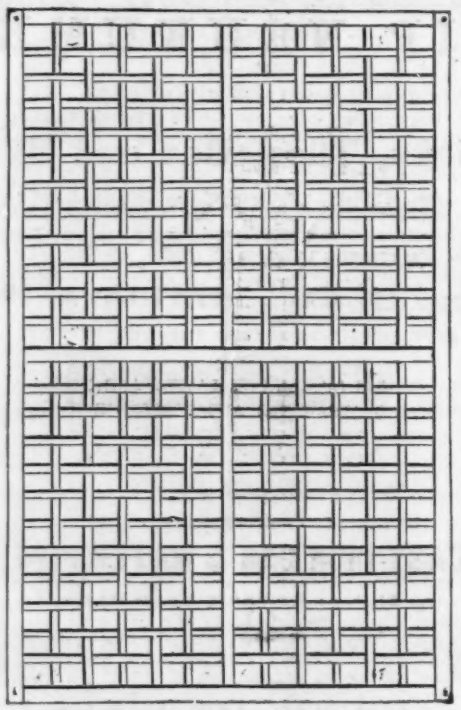

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Your attention is respectfully called to the new and improved Patent GAS SCREEN, now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other Screens now in use.

The Screen is made with an Oak Frame, interlaced with split rattan drawn through holes at regular intervals in the Frame and cross pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the Screen are:

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2d. On account of the free passage of the gas through the Screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4th. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

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Mr. E. Duffee—Dear Sir: We have used your Trays for the last five years in our works, and find them to last the longest, and give the best satisfaction of any we have ever used.

Respectfully yours,
WM. W. WEST, Supt.

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J. M. SOMER,
Supt. Chelsea Gas Co.

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Mr. E. Duffee—Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours,

W. B. BROOKS,
Agent Dorchester Gas-Light Co.

BANGOR, August 2, 1870.

Edward Duffee, Esq.—Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction, and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted.

Respectfully yours,
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| Salem Gas-Light Co., Mass. | Lewiston Gas-Light Co., Me. |
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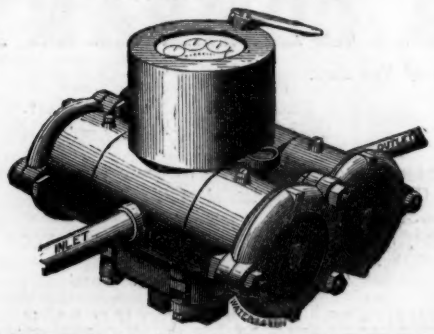


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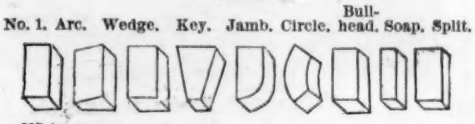

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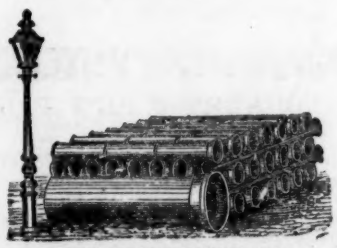

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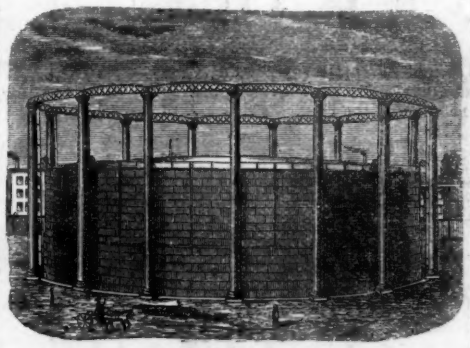

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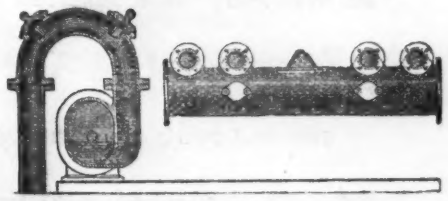

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# THE AMERICAN METER COMPANY.

*Organized under the General Manufacturing Laws of the State of New-York.*

SAMUEL DOWN, President. HENRY CARTWRIGHT, Vice-President. THOMAS J. EARLE, Secretary.

Trustees:

SAMUEL DOWN WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD.
THOMAS C. HOPPER, Superintendent at Philadelphia.

This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS AND REGISTERS, SERVICE and METER COCKS, and all articles in their line appertaining to the use of Gas Works.

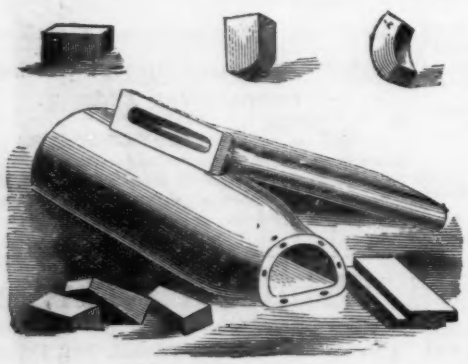
The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy and excellence of Workmanship. Orders addressed

*AMERICAN METER COMPANY,*

West Twenty-Second Street, New York. Arch and Twenty-Second Streets, Philadelphia. 324 Nishington Street, Boston, will meet with prompt attention.

# BALTIMORE RETORT AND FIRE BRICK WORKS.

## GEO. C. HICKS & CO.



Clay Retorts for Gas Works and Sugar Refineries.

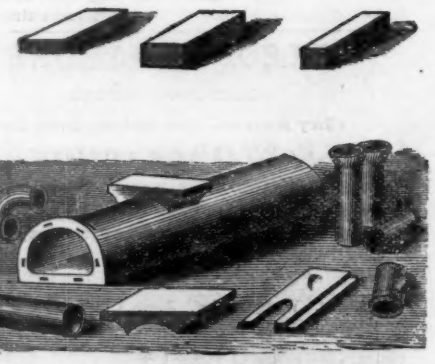
Tiles and Blocks of all kinds.

FIRE BRICK.

Fire Mortar, Fire Clay and Sand.

All kinds of Fire Clay Materials.

The only XX Fire Brick.



GEORGE C. HICKS
AUGUSTE LAMBLA,

Retorts of the various sizes kept on hand.

B. C. HARRIS, Jr.,
Z. F. PARUS.

# HARRIS & BROTHER,

ESTABLISHED 1848.

## PRACTICAL GAS METER MANUFACTURERS,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia, Pa.,

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Indicators, Photometers, and all kinds of Gas Apparatus; Also furnish all other Articles appertaining to the use of Gas Works.

*From our long Practical Experience of the Business (covering a period of 20 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.*

J. Wesley Harris, Washington Harris, Wm. Wallace Goodwin.

P. P. DEILY, J. FOWLER.

**DEILY & FOWLER,**

89 LAUREL STREET, PHILADELPHIA, PENN.,

BUILDERS OF

**GAS WORKS,**

MANUFACTURERS OF

GAS-HOLDERS,

WROUGHT IRON ROOFS,
CHARGING-SCOOPS, COAL WAGONS,
COKE BARROWS, AND ALL WROUGHT
WORK CONNECTED WITH GAS-WORKS.

Particular attention paid to the Extension of Works and Repairs to Gasholders, Purifiers, Etc.; also, Builders of Water Tanks, Oil Stills, Etc.

REFER TO

M. H. Jones, Easton Gas Co., Penn.
Franklin Woolman, Burlington Gas Co., N. J.
O. W. Goodwin, Camden Gas Co., N. J.
Benjam'n Acton, Salem Gas Co., N. J.
D. H. Smith, Watkins Gas Co., Watkins, N. Y.
W. F. Warner, Oswego Gas Co., N. Y.
E. Wilcox, Joliet Gas Co., Ill.
Messrs. Woodbury, Walter & Potter, Kalamazoo Gas Co., Michigan.
H. H. Fish, Utica Gas Co., N. Y.
W. J. Ball, Terre Haute, Indiana.

**PREMIUM GAS STOVES,**

New, Cheap, Clean, Simple and Healthful. No oder, no Dirt, no Soot, no Ashes, no Coal Box, no Punching and Renewing Fire.

**The Cambridge Gas Stove.**

This truly scientific invention received the premium at the State Fair at St. Louis, and is being introduced at the West and also in the New England States, with great success. Certificates of its excellence and superiority from some of our most scientific and influential men are voluntarily given, and will be furnished upon application.

These stoves may be seen in operation at No. 42 Pine street, Room 18, where information may be obtained.

**Worthington's Steam Pump,**

Extensively used by

GAS-LIGHT COMPANIES.

For sale at greatly reduced prices. Also, a new and highly successful PUMP, driven by water pressure, requiring no attention or repairs, and the most economical water motor yet constructed.

Patent GATES for Water and Stem-stops.

HENRY R. WORTHINGTON,
61 Beekman st., New York.

**B. S. BENSON,**

MANUFACTURER OF

**Cast Iron Pipes and Fittings.**

AND

**GAS AND WATER MAINS.**

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

**Office & Factory 52 East Monument St.,**

BALTIMORE, MD.

**The Aubin Balanced**

## VALVE WATER METER,

(Used also for Oils and Liquors.)

Is now in use by many city water companies, because of its Low Price, Simplicity, Durability, Accuracy under any pressure, and, (a great advantage) because it runs with less head than any other meter used.

Manufactured by H. Q. HAWLEY, Albany, N. Y.

**J. J. HOBBIE & SON,**

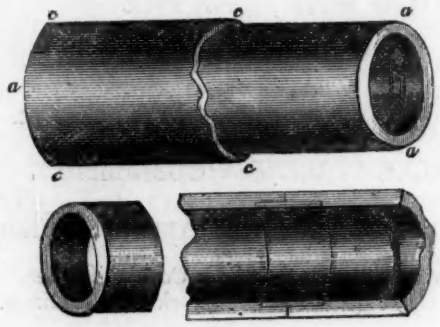
SUCCESSORS TO

WYCKOFF, BROS. & CO.,

**Elmira, N. Y.**

Manufacturers of Wyckoff's Patent Imperishable

## Wooden Water & Gas Pipe.




These Pumps combine

**Strength, Durability and Economy.**

The Water Pipes are the Cheapest and best in use for watering Cities and Villages, conveying water to Railroad Tanks, Distilleries, Breweries, Tanneries, and water courses of every description.

Wyckoff's Patent Gas Pipe is less expensive than other kinds, more serviceable and more durable, being coated, inside and outside, with imperishable material, and impervious to air, gas or water, and warranted to give satisfaction. 219tf

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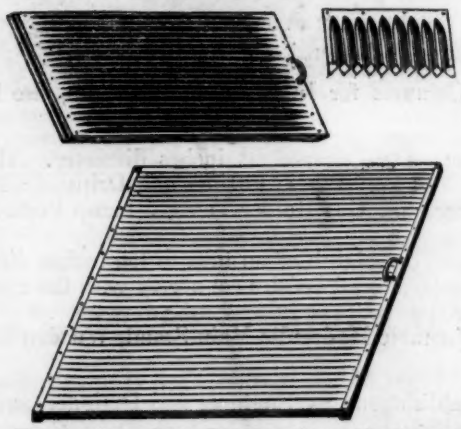
## J. L. Cheesman,

MANUFACTURER OF

**Patent Conically and Diamond Slotted Solid Wood Trays.**



The advantages of these Trays over those made of iron, are economy (they being over 200 per cent. cheaper than iron and will last twice as long), a greatly increased purifying surface, and a saving of time and labor in removing lime, as it does not adhere to the smooth surface of the Wood Trays, as is the case with the iron. The top cut represents the new diamond slotted or reversable Tray, a very superior improvement.

JOHN L. CHEESMAN,
151 and 153 Avenue C, New York.

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## BUTLER'S
## Patent Gas Works.

**JOHN BUTLER, Sole Manufacturer,**

96 MAIDEN LANE, NEW YOYK.

OIL AND ROSIN GAS WORKS (all sizes) for Towns, Factories, Plantations, Churches, and Private Dwellings. These Works are warranted to make cheaper gas than any small Works known, and are very simple to manage. Refer to *over three hundred now in use from one to thirteen years.*

Estimates furnished for cost of Works, and the cost of manufacturing Gas in various localities.

Send for descriptive pamphlet.

1-3m JOHN BUTLER, 96 Maiden Lane.

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## S. FULTON & CO.,
**PLYMOUTH IRON WORKS,**

CONSHOCKEN, PA.,

Manufacturers of

PIG IRON & CAST IRON GAS & WATER PIPES.

Also, Heay and Light Castings of every description.

412 Walnut street, Philadelphia, Pa.

SAMUEL FULTON, THEO. TREWENDT

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DENNIS LONG & CO.,

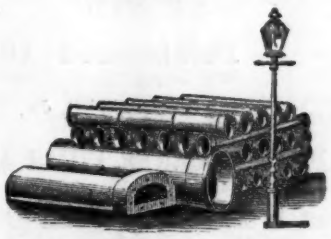
## Union Pipe Works,

**Louisville Pipe Foundry,**

AND

**Union Foundry and Machine Shops,**

LOUISVILLE, KY.



MANUFACTURE

**Cast Iron Gas and Water Pipe,**

All Pipe cast vertically in dry sand.

2 inch Pipes in 8 feet lengths. 3 inch to 60 inch cast in 12 feet lengths.

RETORTS AND MOUTH PIECES, LAMP POSTS, CONDENSING PIPE, HYDRAULIC MAINS, PURIFIERS, DRIPS, ELBOWS, T'S, CROSSES, SLEEVES, VALVES, &c., &c.

**GAS-HOLDERS.**

And every description of work necessary for Gas or Water Companies.

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**BROOKLYN TUBE WORKS.**

## B. T. BENTON,

MANUFACTURER OF

**Wrought Iron and Galvanized**

## TUBES,

FOR STEAM, WATER, OR GAS.

Manufactory and Office,

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## NATIONAL FOUNDRY

AND PIPE WORKS.

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## WM. SMITH,

Manufacturer of all kinds of GAS and WATER PIPE, BRANCHES, CONNECTIONS, T's, ELBOWS, and all CASTINGS USED AT GAS AND WATER WORKS,

We offer special inducements to parties wishing to purchase. My Pipe is Smooth, regular in weights, and cast vertically.

N. B.—Pipe from 3-inch and upwards, cast in 12-ft. lengths.

☞SEND FOR CIRCULAR AND PRICE LIST.☜

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## Camden Iron Works

**Camden, New Jersey,**

MANUFACTURERS OF

ALL KINDS OF CASTINGS AND APPARATUS FOR GAS WORKS,

**WROUGHT IRON ROOF FRAMES,**

For Retort and other houses. Retorts and all castings required for setting them in the latest and most improved model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS, for relieving the Retorts from pressure. PURIFIERS, varying from 2,000 to 2,000,000 cubic feet daily purifying capacity.

**Wrought Iron Lime Sieves,**

for Purifiers. Station Meters of all sizes.

## GAS HOLDERS,

TELESCOPIC AND SINGLE,

With cast iron guide and suspension frames. GAS GOVERNORS or REGULATORS, STREET MAINS, from 1½ to 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SIEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

## WROUGHT IRON WORK.

All the Smith and Sheet Iron work required in and about Gas Works. 226-tf

JESSE W. STARR. BENJ. A. STARR. BENJ. F. ARCHER.

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## OREGON IRON FOUNDRY,

738, 740, 742 & 744 Greenwich Street,

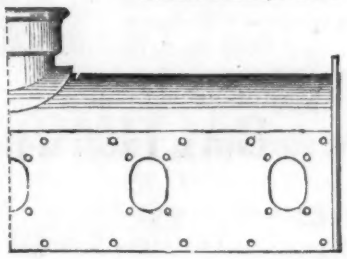
**NEW YORK.**

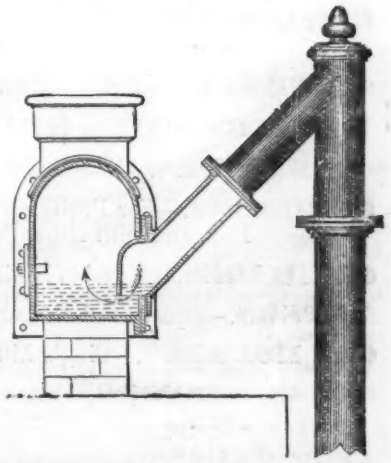
## Castings for Gas Works

OF ALL DESCRIPTIONS

INCLUDING

*PURIFIERS, EXHAUSTERS,*
*COMPENSATORS,*
*SELF-ACTING VALVES*
*BRANCHES, BENDS, &c.*





**FLOYD'S PATENT ADJUSTABLE MAIN,**

FOR BENCHES OF 1, 2, 3, 5 and 6 RETORTS.

By the removal of the front plate only the Main can be adopted to Settings of any number of Retorts desired. The Patent Main can be applied to the ordinary D shaped Main. It offers great facilities for cleaning, and is not liable to stoppage.

FLOYD'S PATENT

**Malleable Iron Retort Lid.**

SABATTON'S PATENT

**FURNACE DOOR AND FRAME.**

REFERS TO—J. A. Sabatton, Esq., Engineer Manhattan Gas Co.—Col. A. J. White, Metropolitan Gas Co.—C. C. Mowten, Engineer New York Gas Light Co.—J. Mowten Saunders, Engineer Baltimore Gas Co.—John T. Harrison, Engineer Savannah Gas Co.

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## SOUTHWARK FOUNDRY,

FIFTH AND WASHINGTON STREETS,

**PHILADELPHIA.**

**MERRICK & SONS, Engineers,**

MANUFACTURERS OF EVERY DESCRIPTION OF GAS MACHINERY.

Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Line Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gas-holders, either Telescopic or Single, with Suspension Frames complete; Wrought Iron Roof-Frames for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps Boilers and Tanks, Steam or Hand Air Pumps, Boilers for proving Street Mains, Centre Seals, Governors, Wrought or Cast-Iron, Line Sieves for Purifiers, Hoisting Machines for Lifting Purifier Covers.

Address— MERRICK & SONS,
5th and Washington Sts., Philadelphia.

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C. GEFRORER. JOHN R. MANDERFIELD, JR.

## GEFRORER & MANDERFIELD,

Manufacturer of

## GAS-BURNERS,

GAS HEATING AND COOKING APPARATUS,

**FITTERS' PROVING APPARATUS. ETC.,**

No. 248 North Eighth Street, Philadelphia.

# MORRIS, TASKER & CO.,

# PASCAL IRON WORKS,

**Corner Fifth and Tasker Streets, Philadelphia, and No. 15 Gold Street, New York.**

**Established 1821,**

STEPHEN MORRIS, THOMAS T. TASKER, Jr., STEPHEN P. M. TASKER.

FOR GAS WORKS MACHINERY, ADDRESS CORNER FIFTH AND TASKER STREETS, PHILADELPHIA.

Manufacturers and Builders of Gas Works, &c., of all Descriptions, of the Most Approved Plans.

**WROUGHT IRON ROOF FRAMES.**—For Slate, or Corrugated Iron Coverings, with Cast Iron Cornice Gutter. Iron Doors and Frames, Wrought Iron Pivot Blinds, Windows and all kinds of Castings and Smith Work for Buildings.

**BENCH CASTINGS.**—Retorts, and all Castings and Wrought Iron Work required for Setting them on the Latest Plan. Tar Gates, Wrought Iron Stand Pipes, Retort Lids, Cotter Bars, Coal and Coke Wagons, and Stokers' Tools.

**EXHAUSTERS.**—Exhausters and Compensators, By-Passes to pass from 4,000 to 150,000 Cubic feet of Gas per hour, with Engines, Governors, Pressure and Vacuum Guages.

**SCRUBBERS.**—Single or Multitubular Scrubbers, with Self-Acting Pumps for Ammonia Water.

**WASHERS.**—Cataract and Single and Multitubular Spray Washers.

**CONDENSERS.**—Single and Multitubular Air and Water Condensers.

**PURIFIERS.**—For Purifying from 1,000 to 2,000,000 cubic feet capacity daily, with either wet or dry Lime, or Oxide of Iron, and with either Ash Rivetted or Wrought or Cast Iron Lime Sieves.

**CARRIAGES.**—Movable Lifting Carriages for Purifiers, arranged either for Floor or Overhead use.

**METERS.**—Square and Round Meters of any capacity.

**GAS HOLDERS.**—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

**GAS GOVERNORS.**—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

**STOP VALVES.**—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating Building, and Gas Holder Tanks. Lamp Posts and Lanterns.

Best quality American Charcoal Iron Boiler Tubes. Wrought Iron Tubes from one-eighth of an inch to ten inches diam., with all kinds of Fittings, Valves and Cocks, Gas and Steam Fitters' Tools, and all articles connected with the manufacture of Gas, Steam or Water.

Sole Manufacturers of P. Munzinger's Patent Purifiers, Dry Center Seals, Adjustable Hydraulic Main Stand, Wooden Lime Trays, Stand and Straddle Pipes, and Multitubular Water Condenser.

Mr. P. MUNZINGER, Gas Engineer, has been connected with our Establishment as Engineer and Designer, and in charge of the Gas Works Department for the past fifteen years.

Plans, Specifications, and Estimates furnished, for Lighting up Towns, Cities, Factories, and Public Buildings, etc., etc., with Gas from Coal, Rosin, or Wood.

We would refer to the Gas Machinery erected by us, and in operation, at the following places:

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Williamsport, Pa.
Altoona, Pa.
Willkes Barre, Pa.
Honesdale, Pa.
Harrisburgh, Pa.
Erie, Pa.
Hanover, Pa.
Easton, Pa.
Lancaster, Pa.
Lock Haven, Pa.
McKeesport, Pa.
Allentown, Pa.
Lebanon, Pa.
Uniontown, Pa.
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Freehold, N. J.
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Jersey City. N. J.
Elizabeth, N. J.
Camden, N. J.
Flemington, N. J.

Metropolitan Works, N. Y. City.
Binghamton, N. Y.
Rome, N. Y.
Utica, N. Y.
Port Jervis, N. Y.
Elmira, N. Y.
Niagara Falls, N. Y.
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Westchester Co., N. Y.
Batavia, N. Y.
Fredonia, N. Y.
Columbus, Ohio.
Mansfield, Ohio.
People's Works, Cleveland, Ohio.
Newark, Ohio.
Salem, Ohio.
Wooster, Ohio.
People's Works, Chicago, Ill.
Chicago Gas-Light and Coke Co., Ill.
Jacksonville, Ill.
Peoria, Ill.
National Asylum for Discharged Volunteer Soldiers, Milwaukee, Wis.

Detroit, Mich.
La Porte, Ind.
Lawrence, Kansas.
Salem, Oregon.
Port-au-Prince, Cal.
San Jose, Cal.
Stockton, Cal.
Illinois State Penitentiary, Joliet.
Hartford, Conn.
Hagerstown, Md.
Peoples Works, Baltimore, Md.
Elkton, Md.
Milledgeville, Ga.
Augusta, Ga.
New Orleans, La.
Shreveport, La.
Louisiana Ice Manufacturing Co.
Nashville, Tenn.
Murfreesboro, Tenn.
Jackson, Miss.
Houston, Texas.
Galveston, Texas.
And a number of others.


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